The documentation and process conversion measures necessary to comply with this revision shall be completed by 22 March 2005.

INCH-POUND

MIL-PRF-19500/684B
22 December 2004
SUPERSEDING
MIL-PRF-19500/684A
27 October 2003

* PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, TRANSISTOR, FIELD EFFECT, SILICON, N-CHANNEL, RADIATION HARDENED (TOTAL DOSE AND SINGLE EVENT EFFECTS), TYPES 2N7472U2, 2N7473U2, AND 2N7474U2, JANTXVR AND JANSR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

* The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-19500.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for an N-channel, enhancement-mode power MOSFET transistor with radiation hardened total dose and single event effects (SEE) ratings, with avalanche energy maximum rating (E_{AS}) and maximum avalanche current (I_{AS}). Two levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

* 1.2 Physical dimensions. See figure 1, (surface mount, TO-276AC, U2).

* 1.3 Maximum ratings. T_A = +25°C, unless otherwise specified.

Type	P_T (1) T_C = +25°C	P_T T_A = +25°C	$R_{\theta JC}$	V_{DS}	V_{DG}	V_{GS}	I_{D1} T_C = +25°C (2) (3)	I_{D2} T_C = +100°C (2) (3)	I_S	I_{DM} (4)	T_J and T_{STG}
	W	W	°C/W	V dc	V dc	V dc	A dc	A dc	A dc	A (pk)	°C
2N7472U2	250	2.5	0.5	130	130	±20	75	57	75	300	-55 to +150
2N7473U2	250	2.5	0.5	200	200	±20	53.5	34	53.5	214	
2N7474U2	250	2.5	0.5	250	250	±20	45	28	45	180	

(1) Derate linearly by 2.0 W/°C for T_C > +25°C.
(2) The following formula derives the maximum theoretical I_D limit. I_D is limited by package and internal construction.

$$I_D = \sqrt{\frac{T_{JM} - T_C}{(R_{\theta JC}) \times (R_{DS}(on) \text{ at } T_{JM})}}$$

(3) See figure 2, maximum drain current graph.
(4) I_{DM} = 4 X I_{D1} as calculated in note (2).

* Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dscc.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil/.

AMSC N/A FSC 5961

* 1.4 Primary electrical characteristics at T_C = +25°C.

Type	Min $V_{(BR)DSS}$ V_{GS} = 0 I_D = 1.0mA dc	$V_{GS(TH)1}$ $V_{DS} \geq V_{GS}$ I_D = 1.0 mA dc		Max I_{DSS1} V_{GS} = 0 V_{DS} = 80% of rated V_{DS}	Max $r_{DS(on)}$ (1) V_{GS} = 12V, I_D = I_{D2}		$R_{\theta JC}$ Max	E_{AS}
					T_J = +25°C	T_J = +150°C		
	V dc	V dc Min	V dc Max	µA dc	Ω	Ω	°C/W	mJ
2N7472U2	130	2.5	4.5	10	0.0135	0.031	0.50	280
2N7473U2	200				0.038	0.087		380
2N7474U2	250				0.060	0.126		222

(1) Pulsed (see 4.5.1).

2. APPLICABLE DOCUMENTS

* 2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

* 2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

* DEPARTMENT OF DEFENSE SPECIFICATIONS

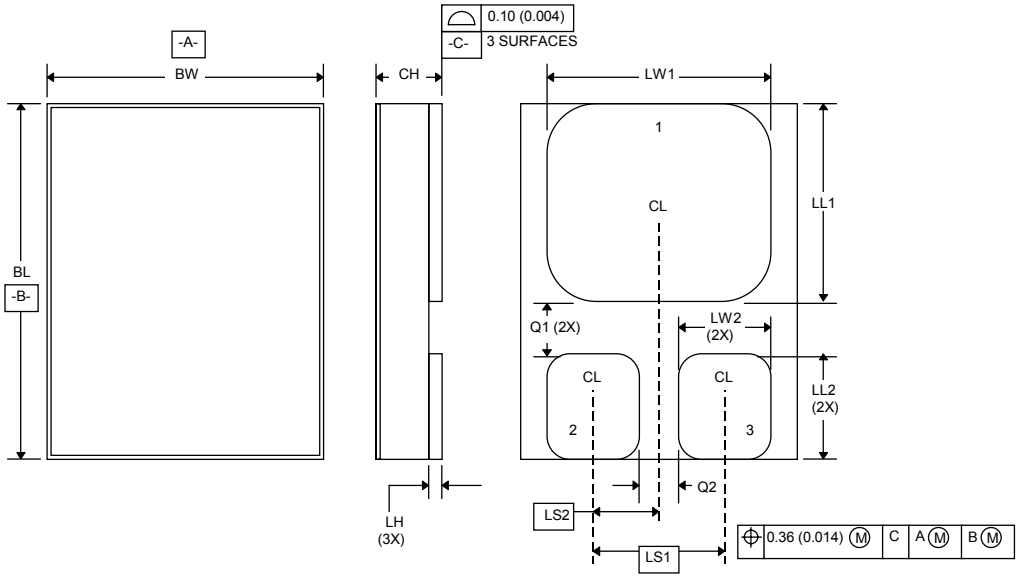
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

* DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-750 - Test Methods for Semiconductor Devices.

* (Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or http://assist.daps.dla.mil/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.685	.695	17.40	17.65
BW	.520	.530	13.21	13.46
CH		.142		3.60
LH	.010	.020	0.26	0.50
LW1	.435	.445	11.05	11.30
LW2	.135	.145	3.43	3.68
LL1	.470	.480	11.94	12.19
LL2	.152	.162	3.86	4.12
LS1	.240 BSC		6.10 BSC	
LS2	.120 BSC		3.05 BSC	
Q1	.035		0.89	
Q2	.050		1.27	
TERM 1	Drain			
TERM 2	Gate			
TERM 3	Source			

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.
4. Terminal 1 – Drain, Terminal 2 – Gate, Terminal 3 – Source.

FIGURE 1. Physical dimensions for surface mount U2 (TO-276AC).

3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500, and figure 1 (TO-276AC, U2) herein. Methods used for electrical isolation of the terminals shall employ materials that contain a minimum of 90 percent Al_2O_3 (ceramic).

3.4.1 Lead finish. Unless otherwise specified, lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

* 3.4.2 Multiple chip construction. Multiple chip construction is not permitted to meet the requirements of this specification.

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. At the option of the manufacturer, marking may be omitted from the body, but shall be retained on the initial container.

3.6 Electrostatic discharge protection. The devices covered by this specification require electrostatic discharge protection.

3.6.1 Handling. MOS devices must be handled with certain precautions to avoid damage due to the accumulation of static charge. However, the following handling practices are recommended (see 3.6).

a. Devices should be handled on benches with conductive handling devices.

b. Ground test equipment, tools, and personnel handling devices.

c. Do not handle devices by the leads.

d. Store devices in conductive foam or carriers.

e. Avoid use of plastic, rubber, or silk in MOS areas.

f. Maintain relative humidity above 50 percent if practical.

g. Care should be exercised during test and troubleshooting to apply not more than maximum rated voltage to any lead.

h. Gate must be terminated to source, $R \leq$ or 100 kΩ, whenever bias voltage is applied drain to source.

* 3.7 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I.

* 3.8 Electrical test requirements. The electrical test requirements shall be as specified in table I.

3.9 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Screening (see 4.3).

* c. Conformance inspection (see 4.4 and tables I and II).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein. Alternate flow is allowed for qualification inspection in accordance with figure 4 of MIL-PRF-19500.

* 4.2.1 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table III tests, the tests specified in table III herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

4.2.1.1 SEE. Design capability shall be tested on the initial qualification and thereafter whenever a major die design or process change is introduced (see table III). End-point measurements shall be in accordance with table II.

* 4.3 Screening (JANS and JANTXV). Screening shall be in accordance with table IV of MIL-PRF-19500 and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500) (1) (2)	Measurement	
	JANS	JANTXV
(3)	Gate stress test (see 4.3.1)	Gate stress test (see 4.3.1)
(3)	Method 3470 of MIL-STD-750, E_{AS} (see 4.3.2)	Method 3470 of MIL-STD-750, E_{AS} (see 4.3.2)
(3) 3c	Method 3161 of MIL-STD-750, thermal impedance, (see 4.3.3)	Method 3161 of MIL-STD-750, thermal impedance, (see 4.3.3)
7	Optional.	Optional.
9	Subgroup 2 of table I herein I_{DSS1}, I_{GSSF1}, I_{GSSR1} as minimum	Not applicable
10	Method 1042 of MIL-STD-750, test condition B	Method 1042 of MIL-STD-750, test condition B
11	I_{GSSF1}, I_{GSSR1}, I_{DSS1}, $r_{DS(ON)1}$, $V_{GS(TH)1}$ Subgroup 2 of table I herein. ΔI_{GSSF1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±10 μA dc or ±100 percent of initial value, whichever is greater.	I_{GSSF1}, I_{GSSR1}, I_{DSS1}, $r_{DS(ON)1}$, $V_{GS(TH)1}$ Subgroup 2 of table I herein.
12	Method 1042 of MIL-STD-750, test condition A	Method 1042 of MIL-STD-750, test condition A
13	Subgroups 2 and 3 of table I herein ΔI_{GSSF1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±10 μA dc or ±100 percent of initial value, whichever is greater. $\Delta r_{DS(ON)1}$ = ±20 percent of initial value. $\Delta V_{GS(TH)1}$ = ±20 percent of initial value.	Subgroup 2 of table I herein ΔI_{GSSF1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{GSSR1} = ±20 nA dc or ±100 percent of initial value, whichever is greater. ΔI_{DSS1} = ±10 μA dc or ±100 percent of initial value, whichever is greater. $\Delta r_{DS(ON)1}$ = ±20 percent of initial value. $\Delta V_{GS(TH)1}$ = ±20 percent of initial value.
14	Required.	Required.

(1) At the end of the test program, I_{GSSF1}, I_{GSSR1}, and I_{DSS1} are measured.
(2) An out-of-family program to characterize I_{GSSF1}, I_{GSSR1}, I_{DSS1}, and $V_{GS(th)1}$ shall be invoked.
(3) Shall be performed anytime before screen 9.

4.3.1 Gate stress test. Apply V_{GS} = 24 V minimum for t = 250 μs minimum.

4.3.2 Single pulse avalanche energy (E_{AS}).

a. Peak current (I_{AS})..... I_{D1}.

b. Peak gate voltage (V_{GS})..... 12 V dc.

c. Gate to source resistor (R_{GS})..... $25 \leq R_{GS} \leq 200\ \Omega$.

d. Initial case temperature ..... +25°C, +10°C, -5°C.

e. Inductance: ..... $\left[\frac{2E_{AS}}{(I_{D1})^2}\right]\left[\frac{V_{BR} - V_{DD}}{V_{BR}}\right]$ mH minimum.

f. Number of pulses to be applied ..... 1 pulse minimum.

g. Supply voltage (V_{DD})..... Rated V_{DS}.

4.3.3 Thermal impedance. The thermal impedance measurement shall be performed in accordance with method 3161 of MIL-STD-750. The maximum limit (not to exceed figure 3, thermal impedance curves and the table I, subgroup 2 limits) for thermal impedance in screening (table IV of MIL-PRF-19500) shall be derived by each vendor by means of statistical process control. When the process has exhibited control and capability, the capability data shall be used to establish the fixed limit. In addition to screening, once a fixed limit has been established, monitor all future sealing lots using a random five piece sample from each lot, to be plotted on the applicable X bar R chart. If a lot exhibits an out of control condition, the entire lot shall be removed from the line and held for engineering evaluation and disposition. This procedure may be used in lieu of an in line process monitor.

a. Measuring current (I_M)..... 10 mA.

b. Drain heating current (I_H) ..... 13.88 A.

c. Heating time (t_H)..... 20 ms.

d. Drain-source heating voltage (V_H)..... 12 V.

e. Measurement time delay (t_{MD})..... 30 - 60 μs.

f. Sample window time (t_{SW})..... 10 μs maximum.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table V of MIL-PRF-19500 and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) and table VIb (JANTXV) of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

* 4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

Subgroup	Method	Condition
B3	1051	Test condition G, 100 cycles.
B3	2077	SEM.
B4	1042	Intermittent operation life, condition D, 2,000 cycles. No heat sink or forced-air cooling on the device shall be permitted during the on cycle. t_{on} = 30 seconds minimum.
B5	1042	Accelerated steady-state gate bias, condition B, V_{GS} = rated; T_A = +175°C, t = 24 hours minimum; or T_A = +150°C, t = 48 hours minimum.
B5	1042	Accelerated steady-state reverse bias, condition A, V_{DS} = rated; T_A = +175°C, t = 120 hours minimum; or T_A = +150°C, t = 240 hours minimum.
B5	2037	Bond strength, test condition A.
B6	3161	Thermal resistance, see 4.5.2.

* 4.4.2.2 Group B inspection, table VIb (JANTXV) of MIL-PRF-19500.

Subgroup	Method	Condition
B2	1051	Test condition G, 25 cycles.
B3	1042	Intermittent operation life, condition D, 2,000 cycles. No heat sink or forced-air cooling on the device shall be permitted during the on cycle. t_{on} = 30 seconds minimum.
B3	2037	Test condition A. All internal bond wires for each device shall be pulled separately.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500 and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

Subgroup	Method	Condition
C2	2036	Terminal strength is not applicable.
C5	3161	Thermal resistance, see 4.5.2.
* C6	1042	Intermittent operation life, condition D, 6,000 cycles. No heat sink or forced-air cooling on the device shall be permitted during the on cycle. t_{on} = 30 seconds minimum.

4.4.4 Group D inspection. Group D inspection shall be conducted in accordance with table VIII of MIL-PRF-19500 and table II herein.

4.4.5 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table IX of MIL-PRF-19500 and as specified in table III herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 Thermal resistance. Thermal resistance measurements shall be performed in accordance with method 3161 of MIL-STD-750. The maximum limit of $R_{\theta JC}$ = 0.50 °C/W. The following parameters shall apply:

a. Measuring current(I_M) ..... 10 mA.

b. Drain heating current (I_H) ..... 13.88 A.

c. Heating time (t_H) ..... Steady-state (see MIL-STD-750, method 3161).

d. Drain-source heating voltage (V_H) ..... 12 V.

e. Measurement time delay (t_{MD}) ..... 30 to 60 μs.

f. Sample window time (t_{SW}) ..... 10 μs maximum.

* TABLE I. Group A inspection.

	Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
		Method	Condition		Min	Max	
	Subgroup 1						
	Visual and mechanical inspection	2071					
	Subgroup 2						
*	Thermal impedance 2/	3161	See 4.3.3	$Z_{\theta JC}$		0.38	°C/W
	Breakdown voltage drain to source	3407	V_{GS} = 0, I_D = 1 mA dc, bias condition C	$V_{(BR)DSS}$			
	2N7472U2				130		V dc
	2N7473U2				200		V dc
	2N7474U2				250		V dc
	Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = 1 mA dc	$V_{GS(TH)1}$	2.5	4.5	V dc
	Gate current	3411	V_{GS} = +20 V dc, bias condition C, V_{DS} = 0	I_{GSSF1}		+100	nA dc
*	Gate current	3411	V_{GS} = -20 V dc, bias condition C, V_{DS} = 0	I_{GSSR1}		-100	nA dc
	Drain current	3413	V_{GS} = 0, bias condition C, V_{DS} = 80 percent of rated V_{DS},	I_{DSS1}		10	µA dc
	Static drain to source on-state resistance	3421	V_{GS} = 12 V dc, condition A, pulsed (see 4.5.1), I_D = I_{D2}	$r_{DS(ON)1}$			
	2N7472U2					0.0135	Ω
	2N7473U2					0.038	Ω
	2N7474U2					0.060	Ω
	Forward voltage	4011	V_{GS} = 0, condition A, pulsed (see 4.5.1), I_D = I_{D1}	V_{SD}			
	2N7472U2					1.2	V dc
	2N7473U2					1.2	V dc
	2N7474U2					1.2	V dc
	Subgroup 3						
	High temperature operation		T_C = T_J = +125°C				
	Gate current	3411	V_{GS} = ±20 V dc, bias condition C, V_{DS} = 0	I_{GSS2}		±200	nA dc
	Drain current	3413	V_{GS} = 0, bias condition C, V_{DS} = 80 percent of rated V_{DS}	I_{DSS2}		25	µA dc

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

	Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
		Method	Condition		Min	Max	
	Subgroup 3 - continued						
	Static drain to source on-state resistance	3421	V_{GS} = 12 V dc, condition A, pulsed (see 4.5.1), $I_D = I_{D2}$	$r_{DS(ON)3}$			
	2N7472U2					0.028	Ω
	2N7473U2					0.080	Ω
	2N7474U2					0.126	Ω
	Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$, I_D = 1 mA dc	$V_{GS(TH)2}$	1.5		V dc
	Low temperature operation		$T_C = T_J$ = -55°C				
	Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS(TH)3}$, I_D = 1 mA dc	$V_{GS(TH)3}$		5.5	V dc
	Subgroup 4						
	Forward transconductance	3475	$I_D = I_{D2}$, V_{DD} = 15 V dc, (see 4.5.1)	g_{FS}			
	2N7472U2				39		S
	2N7473U2				35		S
	2N7474U2				27		S
*	Switching time test	3472	$I_D = I_{D1}$, V_{GS} = 12 V dc R_G = 2.35 Ω, V_{DD} = 50 percent of rated V_{DS}				
	Turn-on delay time			$t_{D(on)}$			
	2N7472U2					35	ns
	2N7473U2					35	ns
	2N7474U2					35	ns
	Rise time			t_r			
	2N7472U2					125	ns
	2N7473U2					125	ns
	2N7474U2					125	ns
	Turn-off delay time			$t_{D(off)}$			
	2N7472U2					80	ns
	2N7473U2					80	ns
	2N7474U2					80	ns
	Fall time			t_f			
	2N7472U2					50	ns
	2N7473U2					50	ns
	2N7474U2					65	ns

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Condition		Min	Max	
Subgroup 5						
Safe operating area test (high voltage)	3474	See figures 4, 5 and 6 t_p = 10 ms min. V_{DS} = 80 percent of max. rated V_{DS}				
Electrical measurements		See table I, subgroup 2				
Subgroup 6						
Not applicable						
Subgroup 7						
* Gate charge	3471	Condition B $I_D = I_{D1}$				
On-state gate charge			$Q_{G(ON)}$			
2N7472U2					160	nC
2N7473U2					155	nC
2N7474U2					165	nC
Gate to source charge			Q_{GS}			
2N7472U2					55	nC
2N7473U2					45	nC
2N7474U2					45	nC
Gate to drain charge			Q_{GD}			
2N7472U2					75	nC
2N7473U2					75	nC
2N7474U2					75	nC
* Reverse recovery time	3473	di/dt = -100 A/µs, $V_{DD} \leq 50$ V $I_D = I_{D1}$	t_{rr}			
2N7472U2					300	ns
2N7473U2					450	ns
2N7474U2					560	ns

1/ For sampling plan, see MIL-PRF-19500.
2/ This test is required for the following end-point measurement only (not intended for 4.3, screen 9, 11, or 13): JANS, table VIa of MIL-PRF-19500, group B, subgroups 3 and 4; JANTXV, table VIb of MIL-PRF-19500, group B, subgroups 2 and 3; and table VII of MIL-PRF-19500, group C, subgroups 2 and 6, and table IX of MIL-PRF-19500, group E, subgroup 1.

* TABLE II. Group D inspection.

Inspection 1/ 2/ 3/	MIL-STD-750		Symbol	Pre-irradiation limits		Post-irradiation limits		Unit
				R		R		
	Method	Conditions		Min	Max	Min	Max	
Subgroup 1 Not applicable								
Subgroup 2 Steady-state total dose irradiation (VGS bias) 4/	1019	T_C = + 25°C V_{GS} = 12 V; V_{DS} = 0						
Steady-state total dose irradiation (VDS bias) 4/	1019	V_{GS} = 0; V_{DS} = 80 percent of rated V_{DS} (preirradiation)						
End-point electricals:								
Breakdown voltage, drain to source	3407	V_{GS} = 0; I_D = 1 mA; bias condition C	$V_{(BR)DSS}$					
2N7472U2				130		130		V dc
2N7473U2				200		200		V dc
2N7474U2				250		250		V dc
Gate to source voltage (threshold)	3403	$V_{DS} \geq V_{GS}$ I_D = 1 mA	$V_{GS(th)1}$					
2N7472U2				2.5	4.5	2.0	4.5	V dc
2N7473U2				2.5	4.5	2.0	4.5	V dc
2N7474U2				2.5	4.5	2.0	4.5	V dc
Gate current	3411	V_{GS} = +20 V, V_{DS} = 0, bias condition C	I_{GSSF1}		100		100	nA dc
Gate current	3411	V_{GS} = -20 V, V_{DS} = 0, bias condition C	I_{GSSR1}		-100		-100	nA dc
Drain current	3413	V_{GS} = 0 V_{DS} = 80 percent of rated V_{DS} (preirradiation) bias condition C	I_{DSS}		10		10	µA dc
Static drain to source on-state voltage	3405	V_{GS} = 12 V; condition A, pulsed (see 4.5.1)	$V_{DS(on)}$					
2N7472U2		I_D = 45 A			0.630		0.630	V dc
2N7473U2		I_D = 35 A			1.365		1.365	V dc
* 2N7474U2		I_D = 31 A			1.586		1.586	V dc
Forward voltage source drain diode	4011	V_{GS} = 0; I_D = 45 A bias condition C	V_{SD}		1.2		1.2	V dc

1/ For sampling plan see MIL-PRF-19500.
2/ Group D qualification may be performed prior to lot formation. Wafers qualified to these group D QCI requirements may be used for any other specification sheets utilizing the same die design.
3/ At the manufacturer's option, group D samples need not be subjected to the screening tests, and may be assembled in its' qualified package or in any qualified package that the manufacturer has data to correlate the performance to the designated package.
4/ Separate samples shall be pulled for each bias.

* TABLE III. Group E inspection (all quality levels) for qualification or re-qualification only.

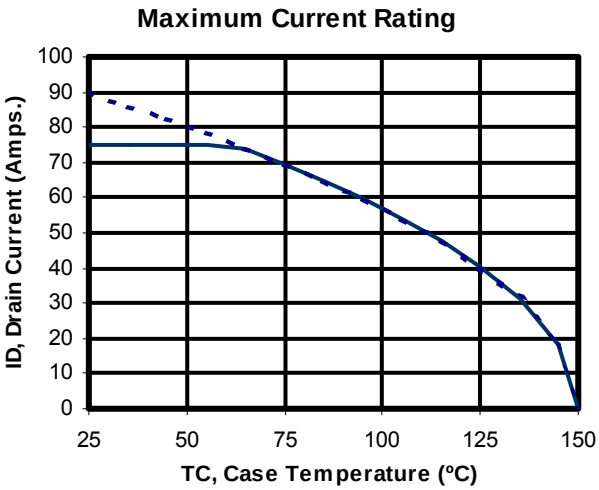
	Inspection	MIL-STD-750		Qualification inspection
		Method	Conditions	
	Subgroup 1			12 devices c = 0
	Temperature cycling	1051	Condition G, 500 cycles	
*	Hermetic seal Fine leak Gross leak	1071	 Test conditions G or H Test conditions C or D	
	Electrical measurements		See table I, subgroup 2	
	Subgroup 2 1/			12 devices c = 0
	Steady-state gate bias	1042	Condition B, 1,000 hours	
	Electrical measurements		See table I, subgroup 2	
	Steady-state reverse bias	1042	Condition A, 1,000 hours	
	Electrical measurements		See table I, subgroup 2	
*	Subgroup 4			Sample size N/A
	Thermal impedance curves		Each supplier shall submit their qual-lot average and design maximum thermal impedance curves to the qualifying activity. In addition, the optimal test conditions and thermal impedance limit shall be provided to the qualifying activity in the qualification report.	
*	Subgroup 5			15 devices c = 0
	Barometric pressure 2N7474U2 only	1001	Test condition C, V_{DS} = 250 V; $I_{(ISO)}$ < 0.25 mA.	
*	Subgroup 6			3 devices
	ESD	1020	Not required for devices classified as ESD class 1.	
*	Subgroup 8			
	Commutating diode for safe operating area test procedure for measuring dv/dt during reverse recovery of power MOSFET transistors or insulated gate bipolar transistors	3476	Test conditions shall be derived by the manufacturer.	22 devices c = 0

See footnotes at end of table.

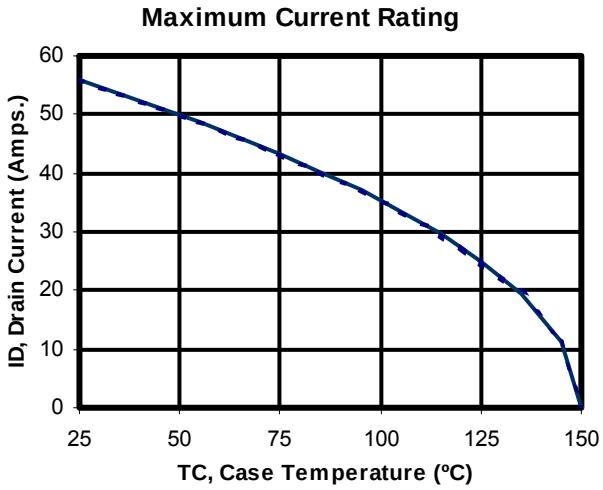
* TABLE III. Group E inspection (all quality levels) for qualification or re-qualification only - Continued.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection
	Method	Conditions	
Subgroup 9			3 devices
SEE 2/ 3/ 4/	1080	See figure 7	
* Electrical measurements 5/		I_{GSSF1}, I_{GSSR1}, and I_{DSS1} in accordance with table I, subgroup 2	
SEE irradiation		Fluence = 3E5 ± 20 percent ions/cm^2 Flux = 2E3 to 2E4 ions/cm^2/sec, temperature = 25 ± 5 °C	
2N7472U2 2N7473U2 2N7474U2		LET = 37 MeV-cm^2/mg, Range = 39 microns, Energy = 305 MeV Insitu bias conditions: V_{DS} = 130 V & V_{GS} = -20 V Insitu bias conditions: V_{DS} = 200 V & V_{GS} = -20 V Insitu bias conditions: V_{DS} = 250 V & V_{GS} = -20 V	
2N7472U2		LET = 60 MeV-cm^2/mg, Range = 32 microns, Energy = 340 MeV Insitu bias conditions: V_{DS} = 130 V & V_{GS} = -10 V V_{DS} = 100 V & V_{GS} = -15 V V_{DS} = 50 V & V_{GS} = -20 V	
2N7473U2		Insitu bias conditions: V_{DS} = 200 V & V_{GS} = -10 V V_{DS} = 185 V & V_{GS} = -15 V V_{DS} = 120 V & V_{GS} = -20 V	
2N7474U2		Insitu bias conditions: V_{DS} = 250 V & V_{GS} = -15 V V_{DS} = 240 V & V_{GS} = -20 V	
2N7472U2		LET = 82 MeV-cm^2/mg, Range = 28 microns, Energy = 350 MeV Insitu bias conditions: V_{DS} = 130 V & V_{GS} = 0 V V_{DS} = 120 V & V_{GS} = -5 V V_{DS} = 30 V & V_{GS} = - 10 V	
2N7473U2		Insitu bias conditions: V_{DS} = 200 V & V_{GS} = -5 V V_{DS} = 150 V & V_{GS} = -10 V V_{DS} = 50 V & V_{GS} = -15 V V_{DS} = 25 V & V_{GS} = -20 V	
2N7474U2		Insitu bias conditions: V_{DS} = 250 V & V_{GS} = -5 V V_{DS} = 225 V & V_{GS} = -10 V V_{DS} = 175 V & V_{GS} = -15 V V_{DS} = 50 V & V_{GS} = -20 V	
Electrical measurements 5/		I_{GSSF1}, I_{GSSR1}, and I_{DSS1} in accordance with table I, subgroup 2	

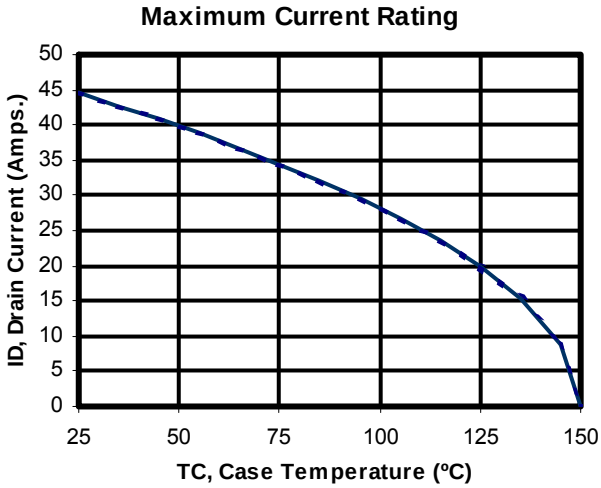
1/ A separate sample for each test shall be pulled.
2/ Group E qualification of SEE effect testing may be performed prior to lot formation. Qualification may be extended to other specification sheets utilizing the same structurally identical die design.
3/ Device qualification to a higher level LET is sufficient to qualify all lower level LET's.
4/ The sampling plan applies to each bias condition.
5/ Examine I_{GSSF1}, I_{GSSR1}, and I_{DSS1} before and following SEE irradiation to determine acceptability for each bias condition. Other test conditions in accordance with table I, subgroup 2, may be performed at the manufacturer's option.



2N7472U2



2N7473U2



2N7474U2

* FIGURE 2. Maximum drain current vs case temperature graphs.

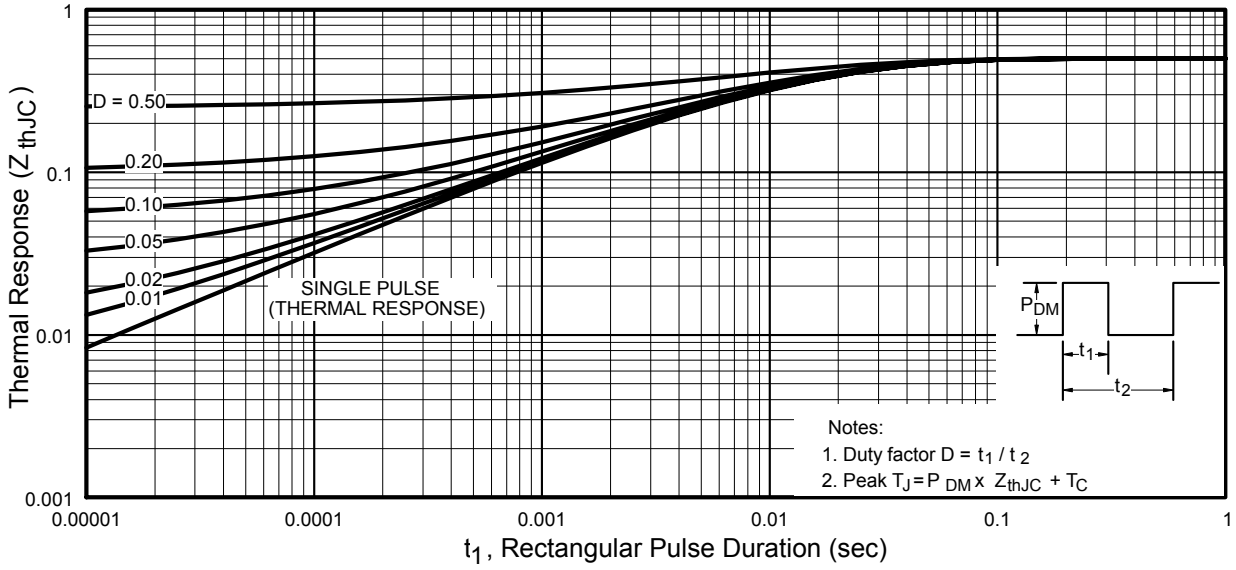
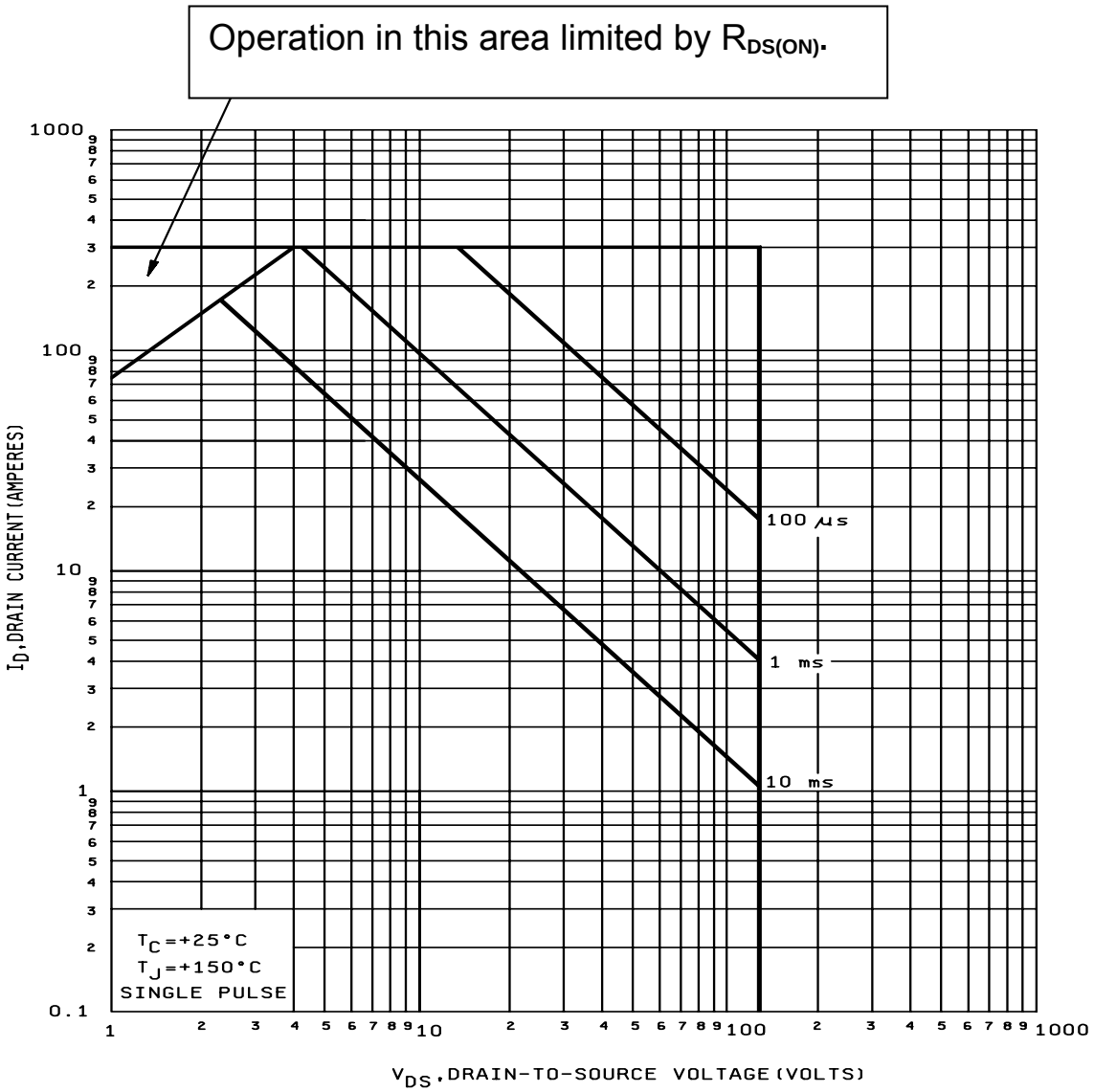


FIGURE 3. Thermal response curve.



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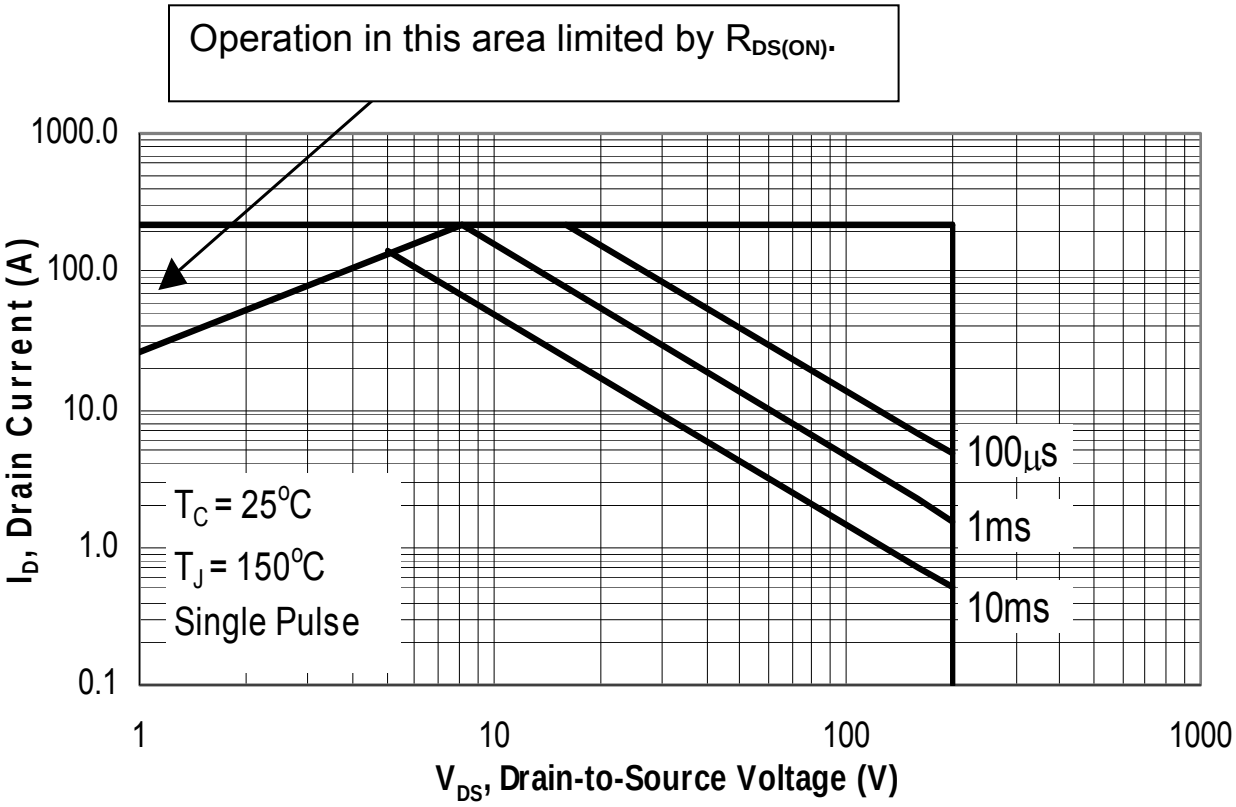
* FIGURE 4. Safe operating area graph.



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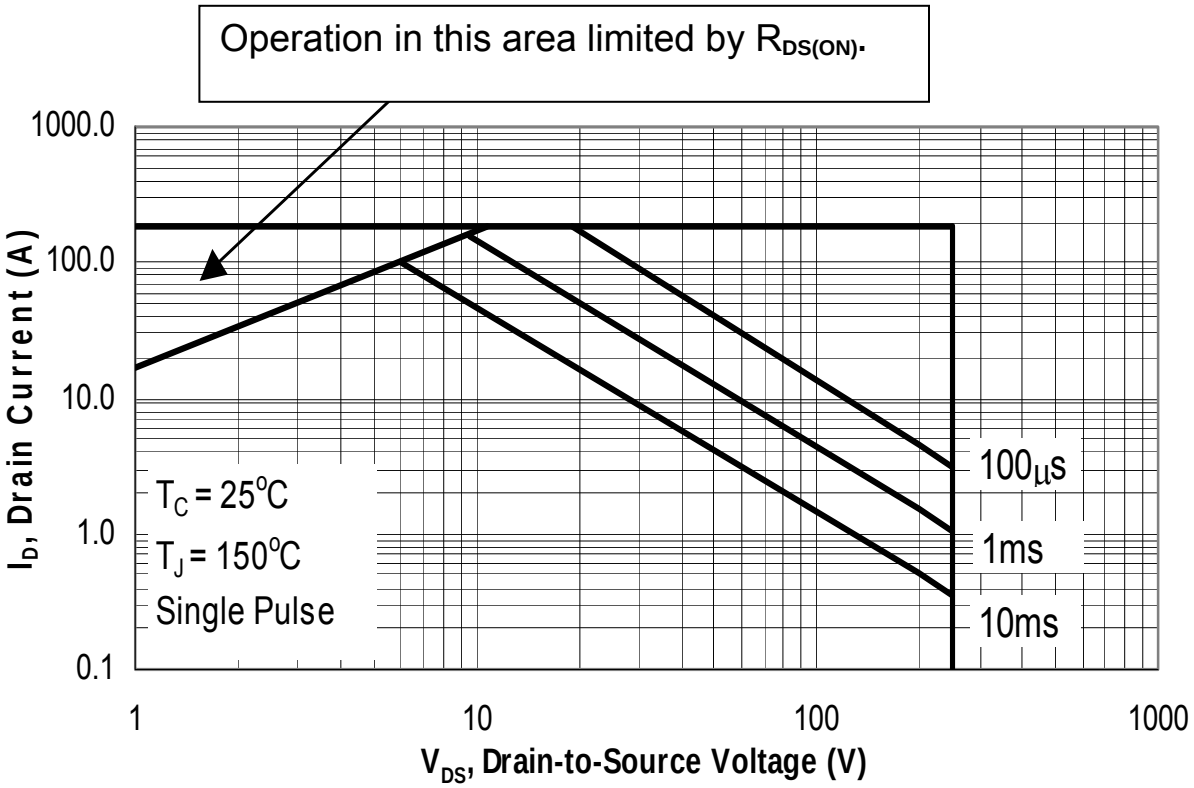
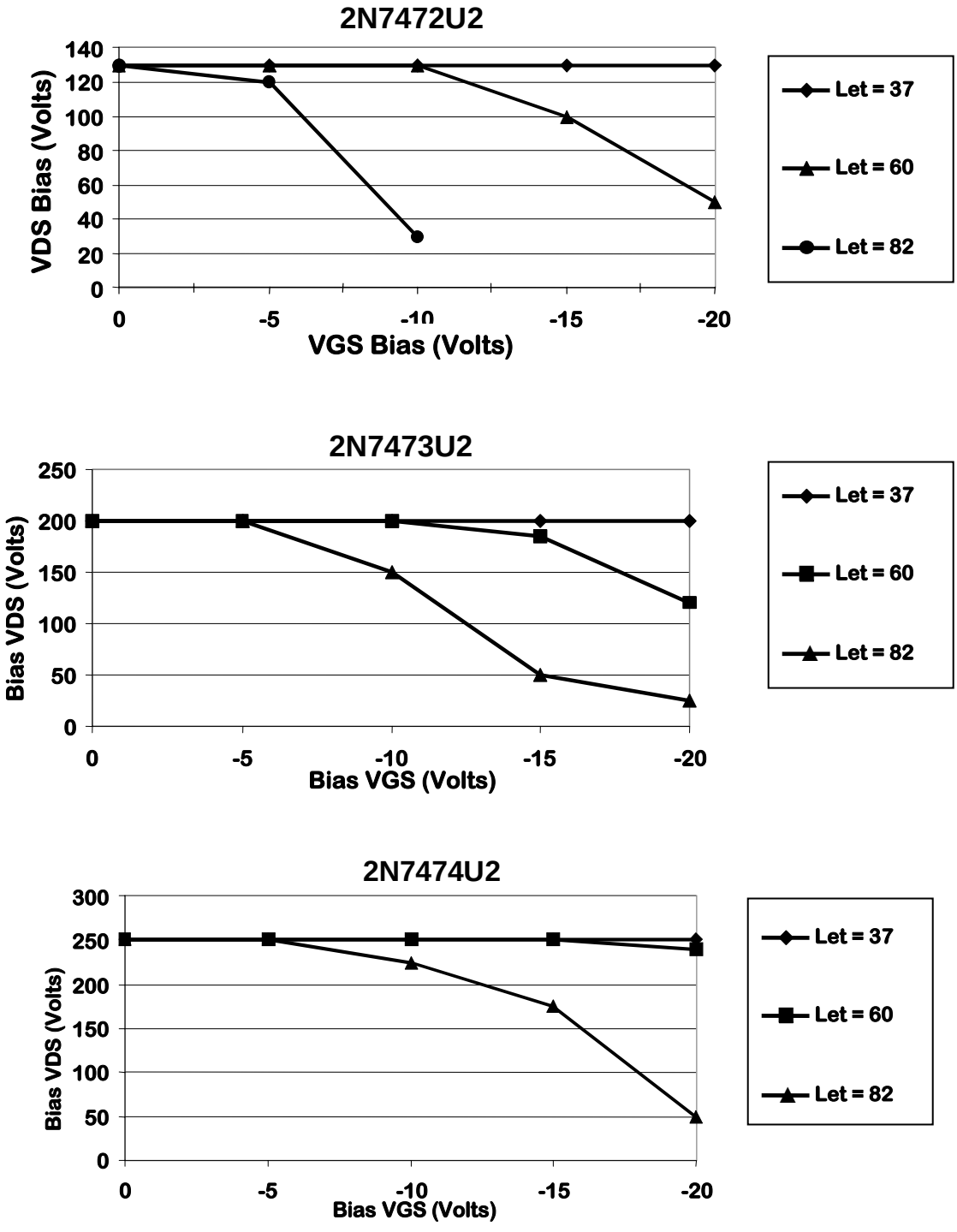
* FIGURE 5. Safe operating area graph.



2N7474U2

* FIGURE 6. Safe operating area graph.



* FIGURE 7. SEE safe operating area graph.

5. PACKAGING

* 5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

* 6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Packaging requirements (see 5.1).

c. Lead finish (see 3.4.1).

d. Product assurance level and type designator.

* 6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil.

6.4 Cross-reference list. The following table shows the generic P/N and its associated military P/N (without JAN and RHA prefix).

Generic P/N	Military P/N
IRHNA57163SE	2N7472U2
IRHNA57260SE	2N7473U2
IRHNA57264SE	2N7474U2

6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - CR
Navy - EC
Air Force - 11
NASA - NA
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2924)

* NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil/ .